

Signal Timing and Operations



Traffic Engineering
Department

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Description:

Traffic signals are installed at intersections to efficiently assign the right of way to conflicting streams of traffic. The City of Pleasanton has over one hundred traffic signals in town. Each individual signal (and the system as a whole) is constantly analyzed to ensure we are maximizing efficiency and safety while minimizing delay.

Some of the advantages of properly installed traffic signals include:

- Provide for the orderly movement of traffic
- Increase traffic handling capacity of intersection
- Reduce frequency of certain types of accidents
- Provide opportunity for continuous movement of traffic at a given speed along a route (signal coordination)
- Allow minor street vehicles and pedestrians to enter or cross the major street

Improperly installed traffic signals may cause:

- Excessive delay
- Disobedience of the traffic signal
- Use of alternate routes to avoid traffic signal
- Increased accident frequency

Signal Operations

In order to keep the traffic flowing safely and efficiently in Pleasanton we have installed a sophisticated communications network that links most of our traffic signals, traffic cameras, and detectors to our Traffic Operations Center.

Having this two way communications with field equipment allows for traffic technicians to monitor traffic signal data and video without having to go out into the field. This gives us the ability to make changes and improvements to traffic signals right from the office. We are also able to collect traffic counts using the cameras and detectors connected to the City's Traffic Operations Center.

The ability to monitor traffic signals from a central location also allows for the instant notification of equipment malfunction (loss of power, signal in flash, detector malfunction, etc) and allows staff to respond quickly to malfunctions and mitigate problems in real time.

Signal Timing

Traffic signals at an intersection are operated by a controller that is connected to vehicle detectors and the traffic signal lights. We use two types of detectors: inductive loops which are buried in the ground and detect metal objects passing over them, and digital cameras which detect the change in contrast as a vehicle passes through a detection zone. When a vehicle is detected it passes a signal to the controller. An intersection equipped with detection is said to be actuated.

The controller is responsible for receiving the signal that a car is waiting and "servicing" that

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vehicle by giving it a green light. To accomplish this, the controller is programmed with all of the different ways a car can travel through an intersection and those are combined into groups called phases (e.g., the two through movements on a major street could be two phases operating simultaneously). The controller and a supplemental "conflict monitor" will not allow the signal to service conflicting phases at the same time (e.g., let the through traffic on the major and minor street be serviced at the same time).

The controller is programmed with how much time in seconds each phase needs for the following elements: the green interval, the yellow interval, the all-red interval, the pedestrian WALK interval, and the pedestrian crossing interval. The time it takes to complete all of the phases one time is called the cycle length. The maximum cycle length is 120 seconds or less at most signals.

Signal Coordination

Along major arterials which have a number of traffic signals spaced at periodic intervals, the traffic signals may be synchronized to provide coordinated movement along the major street. The timing is set such that vehicles traveling at the speed limit may meet the least amount of delay along the arterial. These specially coordinated systems include all or some of the following streets:

- Stoneridge Drive (am/pm peak hours)
- Hopyard Road (all day)
- Santa Rita Road (all day and weekend)
- Stanley Boulevard (am/pm peak hours)
- First Street (am/pm peak hours)
- Sunol Boulevard (am/pm peak hours)
- Valley Avenue (pm peak hours)

Coordinating traffic signals helps the main street traffic flow but can cause some extra delay for the side street traffic. During off-peak hours and late at night, most signals are taken out of coordination and run fully actuated cycling.

Preemption

Most of the traffic signals in town have the ability to be interrupted by emergency vehicles. When an emergency vehicle approaches a traffic signal a strobe light mounted on the vehicle sends a special pulse of light to a sensor on the traffic signal. Once received the normal traffic light cycle is suspended and replaced by the "preemption sequence". The traffic lights to all approaches to the intersection are switched to "red" with the light for the vehicle that has triggered the preemption sequence turning green. This allows the emergency vehicle to respond to the emergency with the least delay. Once the emergency vehicle passes the traffic signal will continue its normal operation.

Contrary to popular belief, flashing your vehicle's headlights will not make the traffic light turn green any faster. The strobe light on emergency vehicles sends a pulse of light headlights cannot duplicate.



If you need further information please call the Traffic Engineering Department at:

925-931-5650